This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-2380}{0}} + \sqrt{63}$$

The solution is Not a Complex Number, which is option B.

A. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

B. Not a Complex Number

* This is the correct option!

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

D. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

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2. Simplify the expression below and choose the interval the simplification is contained within.

$$1 - 2 \div 9 * 20 - (5 * 15)$$

The solution is -78.444, which is option D.

A. $[-75.01, -72.01]$

-74.011, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[-126.67, -123.67]$

-126.667, which corresponds to not distributing a negative correctly.

C. $[71.99, 82.99]$

75.989, which corresponds to not distributing addition and subtraction correctly.

D. $[-83.44, -77.44]$

* -78.444, which is the correct option.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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3. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(5 - 2i)(8 + 10i)$$

The solution is $60 + 34i$, which is option B.

A. $a \in [59, 63]$ and $b \in [-40, -32]$

$60 - 34i$, which corresponds to adding a minus sign in both terms.

B. $a \in [59, 63]$ and $b \in [31, 37]$

* $60 + 34i$, which is the correct option.

C. $a \in [15, 22]$ and $b \in [65, 71]$

$20 + 66i$, which corresponds to adding a minus sign in the first term.

D. $a \in [39, 44]$ and $b \in [-21, -19]$

$40 - 20i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [15, 22]$ and $b \in [-70, -57]$

$20 - 66i$, which corresponds to adding a minus sign in the second term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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4. Simplify the expression below and choose the interval the simplification is contained within.

$$6 - 18^2 + 17 \div 11 * 5 \div 10$$

The solution is -317.227, which is option D.

A. $[-318.23, -317.26]$

-317.969, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[329.64, 330.72]$

330.031, which corresponds to two Order of Operations errors.

C. $[330.23, 331.02]$

330.773, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

D. $[-317.26, -317.09]$

* -317.227, this is the correct option

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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5. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{1560}{8}} + 7i^2$$

The solution is Irrational, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

B. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

E. Irrational

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

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6. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{63 + 44i}{6 + 5i}$$

The solution is $9.80 - 0.84i$, which is option C.

A. $a \in [1.9, 3.1]$ and $b \in [9, 11]$

$2.59 + 9.49i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [9.6, 9.85]$ and $b \in [-51.5, -50]$

$9.80 - 51.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [9.6, 9.85]$ and $b \in [-2.5, 0]$

* $9.80 - 0.84i$, which is the correct option.

D. $a \in [597.5, 598.55]$ and $b \in [-2.5, 0]$

$598.00 - 0.84i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [10.25, 10.9]$ and $b \in [8, 9]$

$10.50 + 8.80i$, which corresponds to just dividing the first term by the first term and the second by the second.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

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7. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-3 - 10i)(8 + 5i)$$

The solution is $26 - 95i$, which is option B.

A. $a \in [23, 31]$ and $b \in [87, 103]$

$26 + 95i$, which corresponds to adding a minus sign in both terms.

B. $a \in [23, 31]$ and $b \in [-99, -90]$

* $26 - 95i$, which is the correct option.

C. $a \in [-74, -70]$ and $b \in [-69, -60]$

$-74 - 65i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-26, -16]$ and $b \in [-50, -48]$

$-24 - 50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [-74, -70]$ and $b \in [64, 66]$

$-74 + 65i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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8. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{8100}{25}}$$

The solution is Integer, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

B. Irrational

These cannot be written as a fraction of Integers.

C. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

D. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

E. Integer

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -90.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

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9. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{27 + 44i}{-2 - i}$$

The solution is $-19.60 - 12.20i$, which is option B.

A. $a \in [-15, -13]$ and $b \in [-44.5, -43.5]$

$-13.50 - 44.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-20.5, -17.5]$ and $b \in [-13, -11.5]$

* $-19.60 - 12.20i$, which is the correct option.

C. $a \in [-99, -97.5]$ and $b \in [-13, -11.5]$

$-98.00 - 12.20i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-20.5, -17.5]$ and $b \in [-62.5, -60]$

$-19.60 - 61.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [-2.5, -1.5]$ and $b \in [-23.5, -22]$

$-2.00 - 23.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

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10. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{40000}{100}}$$

The solution is Whole, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

B. Irrational

These cannot be written as a fraction of Integers.

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Whole

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 200.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.
